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(71) Applicant: ANDREA ELECTRONICS CORPORATION [US/US]; 45 Melville Park Road, Melville, NY 11747 (US).

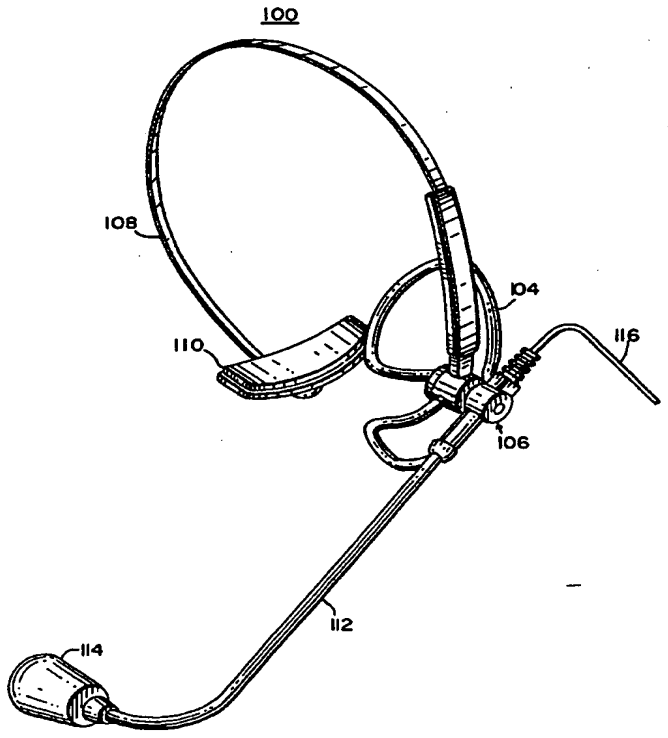
(72) Inventor: ANDREA, Douglas; 165 Brookville Lane, Old Brookville, NY 11545 (US).

(74) Agents: KOWALSKI, Thomas, J. et al.; Frommer Lawrence & Haug LLP, 745 Fifth Avenue, New York, NY 10151 (US).

(54) Title: HEADSET APPARATUS

(57) Abstract

The headset apparatus includes a flexible boom (112) terminating with a microphone (114). The boom can be bent into a desired shape, whereby the microphone can be positioned at or near, for instance, proximate to or adjacent to, a corner of the wearer's mouth so as to achieve a noise cancelling gradient effect; for example, for acoustic noise cancellation performance (proper near field signal and far field noise cancelling).



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TITLE OF THE INVENTION

HEADSET APPARATUS

RELATED APPLICATIONS

Reference is made to U.S. applications Serial Nos. 60/060,494, filed September 30, 1997, and 60/070,883, filed January 9, 1998, both of which are hereby incorporated herein by reference. Reference is also made to U.S. Patent Nos. 5,732,143 and 5,673,325, incorporated herein by reference. Reference is also made to U.S. applications Serial Nos. 29/081,764 filed January 9, 1998 (allowed) and 29/077,250 filed September 30, 1997. All documents cited herein are also incorporated herein by reference. Also, all documents cited in or on documents cited herein are incorporated herein by reference.

FIELD OF THE INVENTION

This invention relates to a headset apparatus. For instance, to a headset having an ear-bud, a flexible boom and a microphone. The flexible boom preferably positions the microphone proximate to the corner of the wearer's mouth (left or right side); for example, to achieve a noise cancelling gradient effect, or for acoustic noise cancellation performance (proper near field signal and far field cancelling). Thus, the microphone is preferably a noise cancelling microphone, such as a pressure gradient noise cancelling microphone, or an active noise cancelling microphone system as disclosed in U.S. Patent Nos. 5,732,143 and 5,673,325.

Furthermore, this invention also relates to a headset having flexible boom which positions the microphone proximate to the wearer's mouth, e.g., proximate to the corner of the wearer's mouth (left or right side); for instance, to achieve a noise cancelling gradient effect, or for acoustic noise cancellation performance (proper near field signal and far field cancelling). The headset can have

a member which extends around the wearer's head, an ear loop which fits over the ear. Alternatively, the headset can have an earpiece which loops over the top and engages the rear of the ear, so as to position an earbud over the outer ear; and, from whence the boom extends. And, in these embodiments, the microphone is preferably a noise cancelling microphone, such as a pressure gradient noise cancelling microphone, or an active noise cancelling microphone system as disclosed in U.S. Patent Nos. 5,732,143 and 5,673,325.

BACKGROUND OF THE INVENTION

Prior art headsets are typically large, and bulky. Prior art headsets typically push against the ear and cause pressure against the ear, such that the wearer experiences discomfort, such as redness or tenderness, from wearing a headset for a prolonged period of time. Thus, a wearer could not use a prior art headset for a prolonged period of time without experiencing discomfort, redness, tenderness, and the like.

There is thus a need for a headset which is lighter in weight than previous headsets, especially a headset which avoids pressure on the ear itself.

There is also a great need to provide a headset which positions the microphone in the corner of the mouth of any wearer. This is particularly important because the success of noise cancellation depends, to a significant degree, on the ability to receive the speaker's voice clearly without interference because positioning the microphone to the corner of the mouth decreases external interference.

Similarly, there is a great need to provide a headset which is both comfortable and freely adjustable, yet firmly remains in place on the wearer's head or ear. Heretofore, there has been no such headset.

In the past, headsets have failed to position the microphone in the corner of the wearer's mouth. Attempts to position the microphone in the corner of the mouth have resulted in headsets which are too cumbersome or uncomfortable to wear. On the other hand, efforts to provide a less cumbersome and more comfortable headset tended to lack the necessary structure to prevent the microphone from easily being jarred from the position of the corner of the mouth.

Other conventional headsets have failed not only to position the microphone in the corner of the mouth but also to position the speaker directly over the ear canal. In such arrangements, efforts to position the microphone neglected to center the speaker above the ear canal of the wearer. Furthermore, the speaker was displaced when the microphone was adjusted in such headsets.

The headsets of the past have been too uncomfortable because they grip the wearer's head too firmly or apply uncomfortable pressure to sensitive portions of the wearer's head such as the area behind the earlobe or any bony area of the head.

It is another problem with the conventional headsets that the speaker or headset is jarred out of position when the user adjusts the microphone to the corner of the mouth. Typically, headsets which attempt to maintain the position of the speaker or headset while the user adjusts the microphone grip the wearer's head uncomfortably.

The present invention takes into account the foregoing problems and provides a headset which positions the microphone in the corner of the wearer's mouth, is comfortable to wear yet is capable of being adjusted without moving the speaker or headset.

OBJECTS AND SUMMARY OF THE INVENTION

An object of the invention is to provide a headset.

Another object of the invention is to provide a headset with a boom microphone.

A further object of the invention is to provide a headset which has a lighter weight than previous headsets; an "ultralight" headset.

A still further object of the invention is to provide a headset having a design which avoids pressure on the ear itself.

A yet further object of the present invention is to provide a headset which is suspended by an ear-bud, yet positions the microphone in the corner of the mouth of any wearer.

Another object of the invention is to provide a headset having an ear-bud, a flexible boom and a microphone.

Yet another object of the present invention is to provide a headset which is both comfortable and freely adjustable, yet firmly remains in place on the wearer's head or ear.

A still further object of the invention is to provide a headset which has an elongated boom which positions a microphone, preferably a noise-cancelling microphone, proximate to or adjacent the corner of the wearer's mouth (left or right side), so as to achieve a noise cancelling gradient effect, or for acoustic noise cancellation performance (proper near field signal and far field cancelling).

Accordingly, in an embodiment, the invention provides a headset having an elongated, preferably flexible, boom terminating with a microphone wherein the boom positions the microphone preferably a noise-cancelling microphone, proximate to or adjacent the corner of the wearer's mouth (left or right side), so as to achieve a noise cancelling gradient effect, or for acoustic noise cancellation performance (proper near field signal and far field cancelling).

In another embodiment the invention provides a headset including an ear-bud having a speaker in a housing therein, and an elongated flexible boom extending from the ear-bud to a microphone, preferably a noise cancelling microphone, positioned at a distal end. The headset can additionally include an earclip which fits over and engages the back of the ear, so as to further stabilize the headset. When worn, the wearer inserts the ear-bud into the ear and positions the microphone to a corner of the mouth of the wearer by adjusting the elongated flexible boom. This positioning of the microphone achieves a noise cancelling gradient effect, or is for acoustic noise cancellation performance (proper near field signal and far field cancelling).

The invention also provides a headset apparatus comprising: earphone means for generating auditory signals from electrical impulses; housing means for housing said earphone means; ear loop means shaped in the form of the perimeter of an ear and coupled to said housing means for receiving said ear such that said ear loop means is positioned between the head and the perimeter of the ear and for suspending said housing means substantially over the auditory canal of said ear; member means coupled to said housing means and extending therefrom to a side of the head for causing said ear loop means to engage the head;

microphone means for receiving auditory signals composed of speech and converting said auditory signals into electrical impulses; and boom means coupled to said housing means for extending said microphone means to a position proximate to the mouth where said microphone means receives said auditory signals.

Other objects, features, embodiments, and advantages according to the present invention will become apparent from the following detailed description of the

illustrated embodiments when read in conjunction with the accompanying drawings in which corresponding components are identified by the reference numerals.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a front-view of the HEADSET of the present application;

Fig. 2 shows a perspective view of the HEADSET;

Fig. 3A shows the right-side view of the HEADSET; Fig. 3B shows the left-side view of the HEADSET;

Fig. 3C shows the front-view of the HEADSET; Fig. 3D shows the top-view of the HEADSET;

Fig. 4 shows a cut-away view of the ear-bud of the HEADSET;

Fig. 5 shows a cut-away view of the microphone of the HEADSET;

Fig. 6 shows the speaker inside the ear-bud in Fig. 1.

Fig. 7 shows a perspective view of another HEADSET of the present invention;

Fig. 8 shows a right-side view of the Figure 7 HEADSET;

Fig. 9A shows a front view of the Figure 7 HEADSET;

Fig. 9B shows a cross-sectional view along line D-D of the HEADSET in Fig. 9A;

Figs. 10A-C show cut-away views along lines A-A, B-B and C-C of the microphone of the HEADSET shown in Fig. 7; and,

Figs. 11-13 show perspective views of additional HEADSET embodiments which are analogous to the Figure 1 HEADSET, except that these HEADSETS have an earclip.

DETAILED DESCRIPTION

Fig. 1 is a front-view of headset 10 of the present invention (Fig. 2 shows a perspective view) including ear-bud 12 shaped to fit comfortably in the ear, a long flexible boom 14 extending from the ear-bud and microphone 16 at the distal end of the boom. Fig. 2 shows a perspective view of headset 10.

Flexible boom 14 is preferably elongated and is preferably made of a soft material, such as soft pliable rubber or plastic which is flexible, yet firmly keeps its position (i.e., has "memory" with respect to maintaining its shape after it has been manipulated into that shape because it is flexible). In the alternative, flexible boom 14 may be comprised of an outer layer of rubber and an inner flexible corrugated metal tube. Other materials may, of course, be suitable. Factors to be considered in selecting a suitable material include their ability to be gripped, flexed and comfortably held. Furthermore, the tube is preferably solid, i.e., a solid boom is preferred, to avoid feedback which could occur from sound traveling up and/or down a hollow tube; that is, in selecting a material for the flexible boom, it is best to avoid acoustic coupling between the speaker and the microphone.

It is also preferred that microphone 16 is a pressure-gradient noise-cancelling microphone with reduced gain or sensitivity in order to cancel far-field noise (e.g., -34 dB or 20 millivolts RMS output typical). However, microphone 16 can be any suitable microphone or any suitable noise cancelling microphone such as microphone systems of U.S. Patents Nos. 5,732,143 and 5,673,325. Thus, it will be appreciated that any such microphone which suppresses background noise and picks-up "close-talking" speech is suitable in the present invention including both active and passive noise cancelling microphones.

Flexible boom 14 is rotatable as shown by the arrow in Fig. 1 about shoulder 30 in order to assist the wearer to position the microphone proximate the

corner of the mouth. Preferably, the shoulder includes a ball-joint or other similar apparatus which allows flexible boom 14 to rotate freely, yet is fixed in position by friction or other means. With this arrangement, it will be appreciated that the wearer may also rotate flexible boom 14 so that the headset may be worn on either left or right ears.

In operation, the wearer inserts ear-bud 12 into an ear and flexible boom 14 extends therefrom toward the wearer's mouth. The wearer rotates and flexes the flexible boom such that microphone 16 is positioned in the corner of the wearer's mouth. The wearer then listens to a speaker (not shown) housed inside ear-bud 12 and speaks into microphone 16 to establish communications over any desired communications apparatus, for example, a computer such as a portable computer, a telephone such as a cellular phone, e.g., utilizing digital compression technology, radio, television or video, or other apparatus such as apparatus using speech recognition. These require a high signal to noise ratio for performance. With this arrangement, the headset of the present invention has proven to remain firmly in place, provide comfort to the wearer, yet position the microphone in or proximate to the corner of the wearer's mouth despite jarring caused by movement of the wearer.

Positioning the microphone to a corner of the mouth of the wearer achieves a noise cancelling gradient effect, or is for acoustic noise cancellation performance (proper near field signal and far field cancelling). More in particular, in embodiments of the present invention, placement of the microphone at or adjacent or proximate to the corner of the mouth is considered important. If the microphone is not close to the mouth, microphone sensitivity must be increased. Increasing microphone sensitivity increases the noise signal received and thus decreases the signal to noise ratio.

For instance, a pressure gradient microphone has holes on both sides, i.e., on its front and back faces, which let in sound which become signals by hitting a diaphragm. If the far field and near field signals are equal, there is equal pressure and no sound transduced, i.e., the diaphragm of the microphone does not move. When the microphone is close to the mouth, with one face closer to the mouth, the near field acoustic energy drives the diaphragm and drives more signal received, thus increasing the signal to noise ratio; that is, when the microphone is closer to the mouth, less sensitivity is required and there is an increased far field effect for a better signal to noise ratio.

However, if the microphone is positioned directly over the mouth, the speaker's breath and pronunciation of certain sounds, e.g., consonant sounds such as "t" and "d", can cause "pops"; unwanted noise effects from speech. Thus, positioning the microphone at or adjacent or proximate the corner of the mouth provides the desired acoustic pressure without the unwanted "pops".

Furthermore, looking into the ear one sees the opening of the ear canal. A dimension from this point - the center of the ear where the ear canal begins - to the corner of the mouth, i.e., the distance or length from the center of the ear where the ear canal begins to the corner of the mouth, has been found by Applicant to be a most desired line; an anthropometric dimension.

Accordingly, the headsets of the present invention can take pressure off the ear itself, and provide a new, light weight or ultralight and stable design, which allows for reducing the sensitivity of the microphone and increasing the signal to noise ratio.

Figs. 3A-3D illustrate several views of the headset of the present invention including the right-side view shown in Fig. 3A, the left-side view shown in Fig. 3B, the front-view shown in Fig. 3C and the top-view shown in Fig. 3D.

It will be appreciated from Figs. 3A-3D that the present invention, in one embodiment, includes contact point 20 which contacts the wearers head in such a manner that provides leverage when the wearer adjusts flexible boom 14. Preferably, the contact point 20 is located to fit in the temple of the wearer's head which has proven to be the most comfortable area to apply pressure because the temple consists of a fleshy recessed area which provides a natural pad protecting the wearer's skull.

With this feature, the wearer can bend the flexible boom easily without yanking the ear-bud from the wearer's ear because the force of bending the microphone is absorbed by contact point 20. In this manner, the wearer adjusts the position of microphone 12 in the corner of the wearer's mouth without upsetting the position of headset. Thus, the headset of the present invention forms a single unit which is suspended solely by ear-bud 12 and includes only one other contact point 20.

Fig. 3C shows that the headset of the present invention may include jack 18 for coupling microphone 16 and speaker 26 to a communications apparatus, for example, a computer such as a portable computer, a telephone such as a cellular phone, e.g., utilizing digital compression technology, a radio, television or video apparatus, or other apparatus such as apparatus using speech recognition. Of course, the coupling means may be a wireless transmitter/receiver.

Further, the headset of the present invention shown in Fig. 3C optionally includes a rigid-neck piece 28 and shoulder 30 which the wearer can readily grasp and insert ear-bud 12 into the ear. Further, neck 28 and shoulder 30 act as a lever with the fulcrum being contact-point 20 when the wearer adjusts flexible

boom 14 which operates to absorb the force of adjusting the microphone such that the headset is not jarred.

In addition, the headset shown in Fig. 3C includes microphone cover 24, which may be made of any suitable material to protect the mouth of the wearer as well as the microphone. Preferably, a material is chosen which dampens high-frequency noise, such as caused by the lisp of the wearer. Speaker cover 22 is also optionally provided which is made from a comfortable rubber or plastic material which grips the inside of the ear to ensure stable fitting within the ear and which is made from a material which protects the wearer's ear from abrasion. Further, the headset shown in Fig. 3C preferably includes another shoulder and neck 32 made of a rigid material for housing microphone 16.

In operation, the wearer grasps headset 10 by neck 28 and shoulder 30 and inserts ear-bud 12 comfortably into the ear. Meanwhile, jack 18 has been inserted into an input port for receiving signals, e.g., from a communications apparatus such as a computer for instance a portable computer, a telephone such as a cellular phone, e.g., utilizing digital compression technology, a radio, television or video apparatus, or other apparatus such as apparatus using speech recognition. The wearer grasps flexible boom 14 and adjusts microphone 16 by applying leverage to neck 28 and shoulder 30 across contact-point 20 to the corner of the wearer's mouth where the flexible boom and microphone remain firmly in place. The wearer then commences communication using the headset of the present invention without fear of jarring the microphone or headset.

Fig. 4 depicts a cut-away view of ear-bud 12, neck 28, contact-point 20 and shoulder 30 of the present invention. As shown, speaker 26 is protected by speaker cover 22 in a housing preferably made of plastic or other suitable material.

In one embodiment of the invention, the housing of ear-bud 12 is assembled from two snap-on pieces including a first piece 34a and a second piece 34b. With this arrangement, speaker 26 may be easily assembled inside ear-bud 12 and connected to connection points 36.

Fig. 5 depicts a cut-away view of microphone 16, shoulder 32 and flexible boom 14 of the present invention. In a preferred embodiment, microphone 16 is assembled in a housing of the speaker and connected through wires 38a, 38b and 38c which propagate through flexible boom 14 for connection to jack 18 (Fig. 3C). Preferably, microphone 16 is a pressure-gradient microphone which has pressure holes 40 on the microphone's rear-side. These pressure holes should be kept free of solder and flux during assembly. In addition, it is preferable that wires 38 a,b,c are routed as shown to prevent covering the pressure holes.

Fig. 6 depicts speaker 26 inside ear-bud 12. It will be appreciated that wires 42 a,b,c connect to the speaker. Of course, another suitable arrangement is equally acceptable.

Fig. 7 is a perspective view of the headset 100 in the present invention wherein ear loop (ring) 104 is coupled to ear-phone assembly 106 and fits around the perimeter of the wearer's ear, (head band) member 108 extends around the wearer's head ending in pad 110, and boom 112 extends microphone 114 to a position proximate the wearer's mouth. Microphone 114 and ear-phone assembly 106 send/receive electrical impulses corresponding to acoustic signals to/from cord 116.

In a preferred embodiment, ear loop 104 is made of a soft, yet firm material shaped like the perimeter of the ear such that the ear loop fits comfortably between the perimeter of the wearer's ear (pinna) and the head without applying too much pressure to the head of the wearer. Ear loop 104 may comprise a continuous

rubber tube or a rigid interior tube with a soft exterior material to achieve this purpose. Ear loop 104 should be shaped such that the ear-phone assembly coupled thereto is situated centrally over the auditory canal (meatus) when the ear loop is placed around the ear of any wearer.

In conjunction with member 108 and pad 110, ear loop 104 firmly, yet gently, locks headset 100 into place, thereby resisting jarring of the headset that tends to cause ear loop 104 to move toward or away from the wearer's head. In addition, ear loop 104 of this embodiment connects to ear-phone assembly 106 where the pinna and lobe meet the wearer's head, thereby circumscribing essentially the entire ear. With such an arrangement, the headset of the present invention not only resists jarring that tends to cause ear loop 104 to move in substantially 360 degrees of movement around the ear but also centers the ear-phone assembly 106 directly over the ear canal. Moreover, since the ear loop 104 connects to the ear-phone assembly 106 where the pinna and lobe meet the head, the ear loop 104 does not impair the wearer's hearing.

Ear-phone assembly 106 is preferably an ear-phone integrated within a central housing assembly which supports ear loop 104, member 108 and boom 112. Integrating the earphone within the central housing assembly in this manner centrally locates the earphone therein over the auditory canal while providing a housing coaxial to this canal. With this coaxial arrangement, ear loop 104, member 108 or boom 112 may be independently adjusted about auditory canal with minimal translational stress to the other parts thereby allowing headset 100 to be freely adjusted, while firmly maintaining the other parts in place. Thus, the present invention at once elegantly reduces bulkiness by placing the earphone neatly into the central housing assembly while providing a headset which firmly maintains its position while being adjusted.

Member 108 extends around the wearer's head to snugly engage ear loop 104 to the wearer's head around the ear. In the illustrated embodiment, member 108 is an elongated arcuate length of flexible metal which extends over the top of the wearer's head and ends in a comfortable pad 110 which contacts the wearer's head opposite ear loop 104. Pad 110 is preferably comprised of a plastic housing shaped to comfortably fit the wearer's head with a soft sponge-like material on the contacting side. It is also preferred that member 108 includes a sleeve from which member 108 is dispensed such that member 108 may be adjusted in length to fit different wearer's.

Microphone 114 is analogous to microphone 14 previously described and is preferably a pressure-gradient noise-cancelling microphone with reduced gain or sensitivity in order to cancel far-field noise (e.g., -34 dB or 20 millivolts RMS output typical). It will be appreciated that any such microphone which suppresses background noise and picks-up "close-talking" speech is suitable in the present invention. Thus, one can also use the noise cancelling microphone system of U.S. Patents Nos. 5,732,143 and 5,673,325.

In operation, the wearer places headset 100 on the head by opposing pad member 110 and ear-phone assembly 106 sufficiently to fit member 108 around the crown of the head. Then, with pad member 110 contacting one side of the head, the wearer fits ear loop 104, now on the opposite side, around the perimeter of the ear with housing assembly 106 situated centrally over the wearer's auditory canal. At this time, boom 112 should extend microphone 114 at or proximate to the wearer's mouth.

The wearer then adjusts any of the parts of headset 100 freely and independently from any other part. Thus, for example, the wearer may adjust the length of member 108 by extending the same from the plastic dispenser such that headset 100 comfortably rests on the wearer's head with ear loop 104 properly

positioned to receive the ear such that ear-phone assembly 106 is suspended centrally over the auditory canal. Independent of this adjustment, the wearer may rotate ear loop 104 about the central axis (auditory canal) of ear-phone assembly 106 such that the ear loop is in the correct orientation to receive the ear comfortably. Further, the wearer may independently adjust boom 112 about the central axis of ear-phone assembly 106 to place the microphone to a position proximate to the wearer's mouth. Any insignificant translational moments caused by these adjustments are absorbed harmlessly by ear loop 104.

Fig. 8 shows a right-side view of the Figure 7 headset embodiment of the present invention. It will be appreciated from this perspective, that ear loop 104, member 108 and boom 112 are each connected to ear-phone assembly 106 about the central axis of the auditory canal. It will also be appreciated that ear loop 104 substantially circumscribes the perimeter of the ear when worn, thereby providing stability in essentially 360 degrees of movement. It is also more apparent from this figure that ear loop 104 is connected to earphone assembly housing 106 where the pinna and lobe meet the head.

In addition to the foregoing, Fig. 8 shows jack 118 which couples the electrical impulses corresponding to auditory signals to/from a host device. Preferably, jack 118 is a three-terminal plug (tip, ring and sleeve) for carrying noise cancellation signals from microphone 114 to a noise cancellation apparatus which subtracts the far-field signal from the near-field signal to obtain substantially noise-free speech.

Now, with reference to Figs. 9A and 9B, the independent movement of each part of headset 100 of the present invention will be more specifically described. In the embodiment shown in Figs. 9A and 9B, ear loop 104 and boom 112 are

independently rotatable about the central axis D-D of the auditory canal. The boom 112 is additionally rotatable about its longitudinal axis. In addition, member 108 is rotatable about an axis perpendicular to the central axis. Further, boom 112 is rotatable about shoulder 120, also perpendicular to the central axis. With this arrangement, each portion of the headset is independently rotatable such that adjustment or jarring by the wearer does not cause other portions of the headset to be jarred thereby maintaining the position of the microphone to the corner of the wearer's mouth and the speaker central over the auditory canal.

Fig. 9B illustrates in detail the ear-phone assembly 106 of the present invention comprising three independently moveable sections 106a, 106b and 106c. These moveable sections are joined such that each is rotatable freely about the central axis independent of the others. Within ear-phone assembly 106 is a pair of earphones (speakers), each comprising a diaphragm moving element 106d and a diaphragm 106e, which are controlled by electrical impulses from cord 16 to produce the auditory signals.

Fig. 10A depicts a cut-away view of microphone 114, shoulder 132 and flexible boom 112 of the present invention. In a preferred embodiment, microphone 114 is assembled in a housing of the speaker and connected through wires 124 and 126 which propagate through flexible boom 112 for connection to jack 118 (Fig. 8). Preferably, microphone 114 is a pressure-gradient microphone which has pressure holes 128 on the microphone's rear-side. These pressure holes should be kept free of solder and flux during assembly. In addition, it is preferable that wires 126 and 128 are routed to prevent covering the pressure holes.

As illustrated in Figs. 10B and 10C microphone 114 includes microphone cover 130, which may be made of any suitable material to protect the

mouth of the wearer as well as the microphone. Preferably, a material is chosen which dampens high-frequency noise, such as the lisp of the wearer. Shoulder 132 is provided such that the wearer can grasp and adjust the position of the microphone proximate to the mouth without damaging the microphone. A microphone housing 134 is also provided to house the microphone components.

Figs. 11 to 13 illustrate additional embodiments (300, 400 and 500) of the invention which are analogous to the foregoing described embodiments.

The embodiments of Figs. 11 to 13 are especially analogous to the embodiments shown in Figs. 1 to 6, such that components 312, 412, and 512 of Figs 11 to 13 are analogous to component 12 of Figs. 1 to 6. Components 314, 414 and 514 are analogous to component 14 of Figs. 1 to 6. Components 316, 416, and 516 are analogous to component 16 of Figs. 1 to 6. And, components 330, 430 and 530 are analogous to component 30 of Figs. 1 to 6.

Essentially, Figs. 11 to 13 illustrate in perspective view embodiments analogous to the Fig. 1 to 6 embodiments wherein there is earclip 1000 positioned behind the earbud (12, 312, 412, 512). (Also shown in Figs. 11 to 13 is windsock 301, 401 or 501 which would be placed over housing 16 in the embodiments of Figs. 1 to 6). Earclip 1000 is generally arcuate in shape, designed to fit around the back of the ear (to, for instance, fit with or around curved surfaces of the back of the ear). Earclip 1000 has portion 1001 which rises upwardly and terminates with curved portion 1002; and, curved portion 1002 terminates with extended portion 1003.

The use of the headset of Figs. 11 to 13 is analogous to the use of the headset of Figs. 1 to 6, except that additionally, the wearer positions earclip over and behind the ear so as to provide a bias or pressure against the ear.

In regard to the earclip 1000, reference is made to U.S. Patents Nos. D392,290 and 5,414,769, incorporated herein by reference. U.S. Patents Nos. D392,290 and 5,414,769 show an apparatus with an earband which terminates with a flexible teardrop shape member. The earclip 1000 of the present invention is used in an analogous manner to the earband of U.S. Patents Nos. D392,290 and 5,414,769. Thus, portion 1001 of earclip 1000 rises over the exterior of the wearer's ear, and portions 1002 and 1003 are positioned behind the wearer's ear, with portion 1002 mating with a curved portion in the back of the wearer's ear and portion 1003 proximate to or adjacent with the back of the earlobe.

Although preferred embodiments of the present invention and modifications thereof have been described in detail herein, it is to be understood that this invention is not limited to those precise embodiments and modifications, and that other modifications and variations may be affected by one skilled in the art without departing from the spirit and scope of the invention as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A headset apparatus comprising:

an ear-bud having a speaker in a housing therein;

an elongated flexible boom extending from said ear-bud;

a microphone positioned at a distal end of said flexible boom; and

wherein, a wearer inserts the ear-bud into an ear and positions the microphone to a corner of a mouth of a wearer by adjusting the elongated flexible boom.

2. A headset apparatus comprising:

earphone means for generating auditory signals from electrical impulses;

housing means for housing said earphone means;

ear loop means shaped in the form of the perimeter of an ear and coupled to said housing means for receiving said ear such that said ear loop means is positioned between the head and the perimeter of the ear and for suspending said housing means substantially over the auditory canal of said ear;

member means coupled to said housing means and extending therefrom to a side of the head for causing said ear loop means to engage the head;

microphone means for receiving auditory signals composed of speech and converting said auditory signals into electrical impulses; and

boom means coupled to said housing means for extending said microphone means to a position proximate to the mouth where said microphone means receives said auditory signals.

3. The headset apparatus of claim 1 wherein the microphone means is a noise cancelling microphone.

4. The headset apparatus of claim 2 wherein the microphone means is a noise cancelling microphone.

5. The headset apparatus of claim 1 further comprising an earclip positioned behind the ear-bud for engaging the back side of the wearer's ear.

6. In a headset apparatus having a boom terminating with microphone means wherein the improvement comprises the boom being comprised of a flexible material which retains shape whereby the boom can be positioned such that the microphone means is at, or proximate to, or adjacent to, a corner of a wearer's mouth.

7. The headset apparatus of claim 6 wherein the microphone means is a noise cancelling microphone and positioning the microphone at, or proximate to, or adjacent to, a corner of a wearer's mouth is to achieve a noise cancelling gradient effect.

8. A method for listening to a first signal and/or transmitting a second signal comprising employing a headset apparatus of any one of claims 1 to 7.

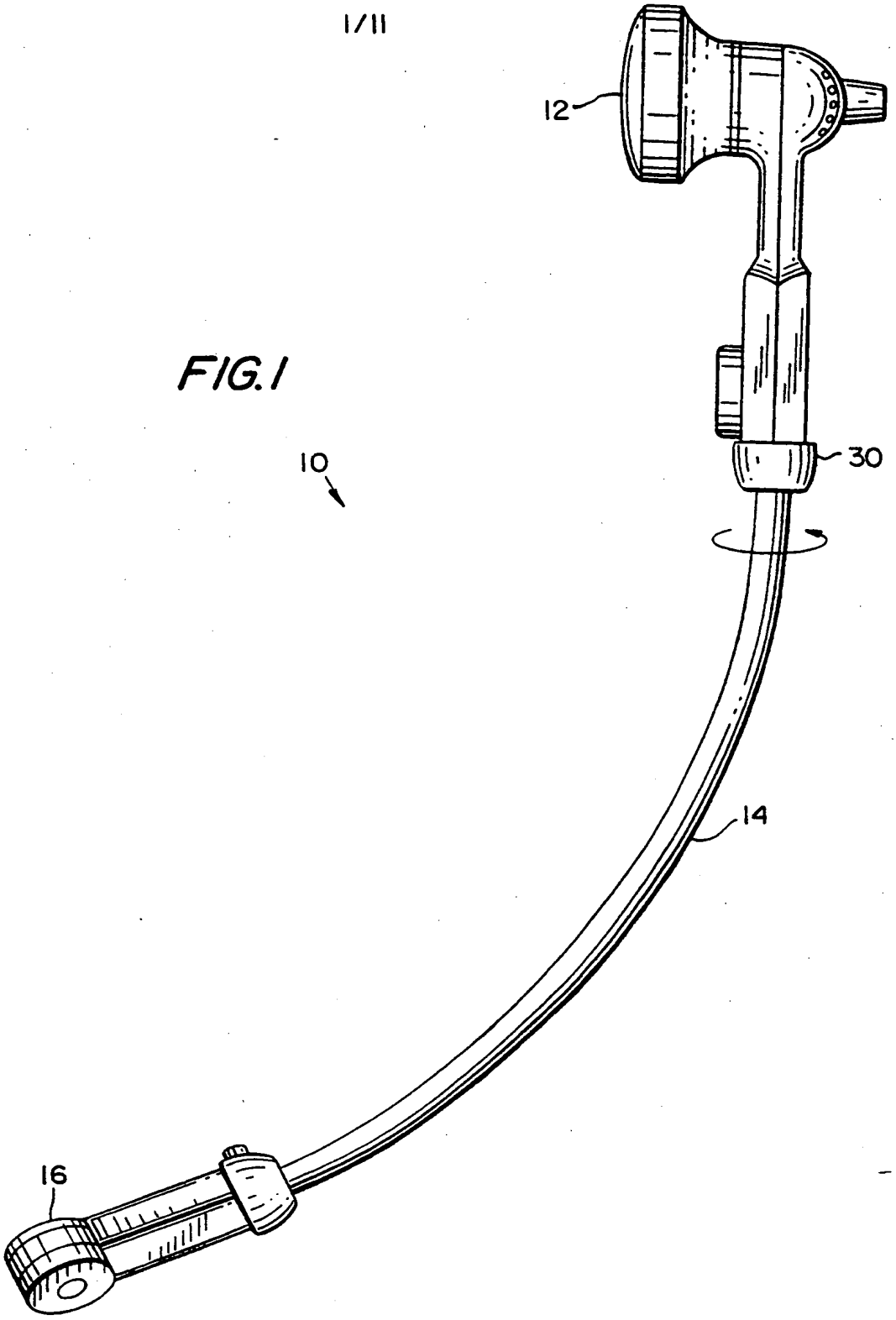


FIG. 1

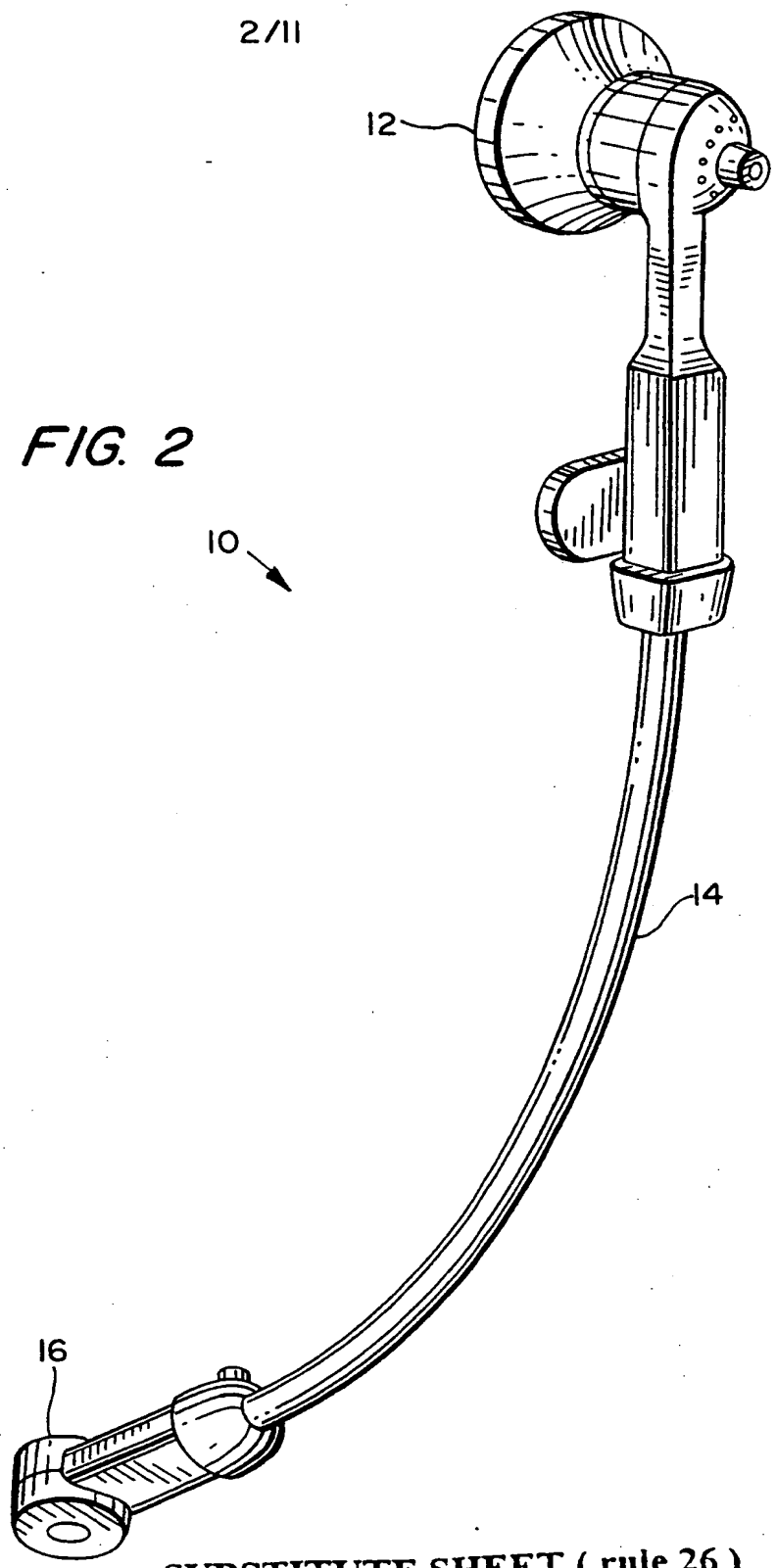


FIG. 2

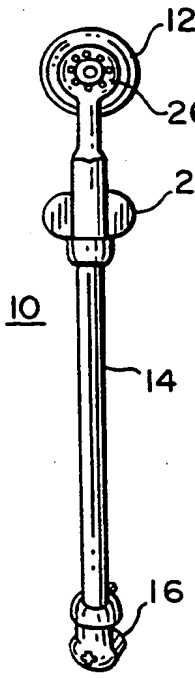


FIG.3A

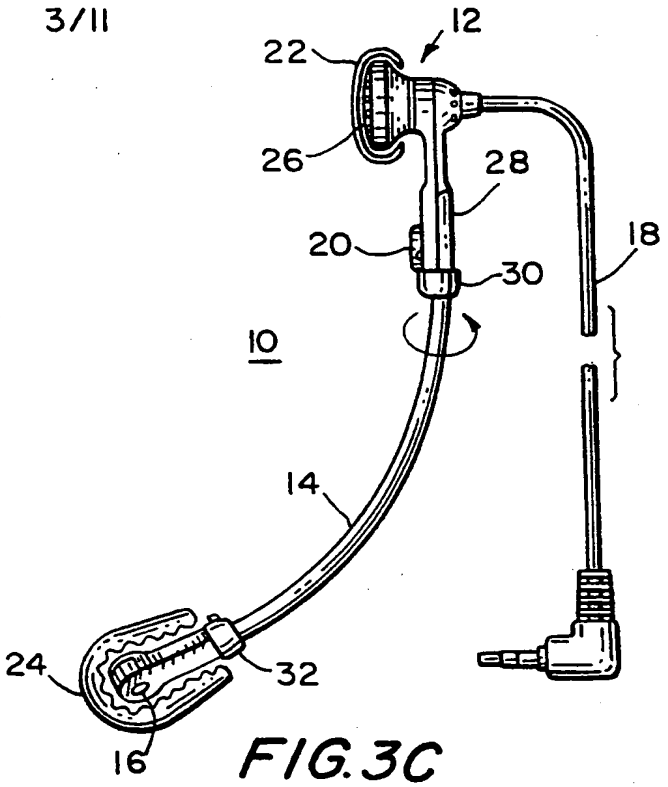


FIG.3C

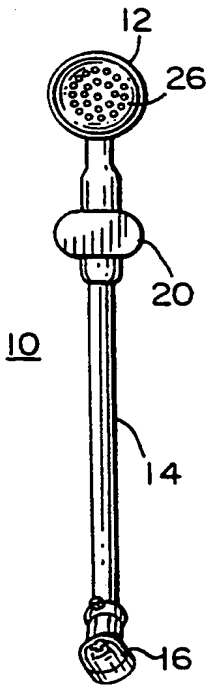
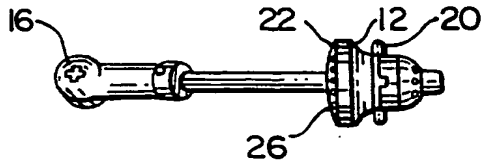


FIG.3B

FIG.3D



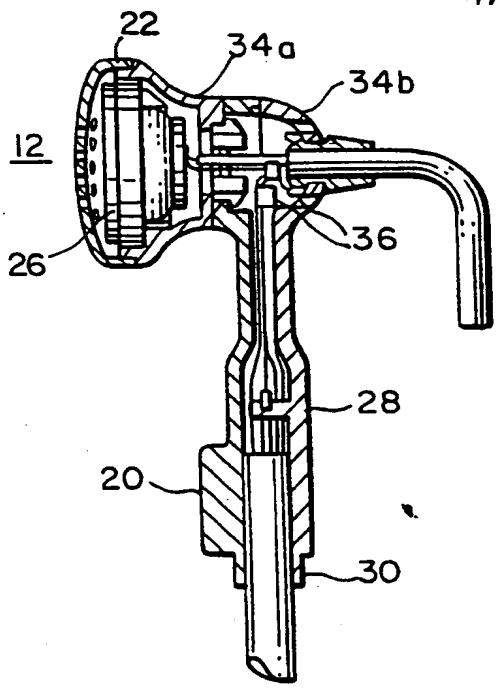


FIG.4

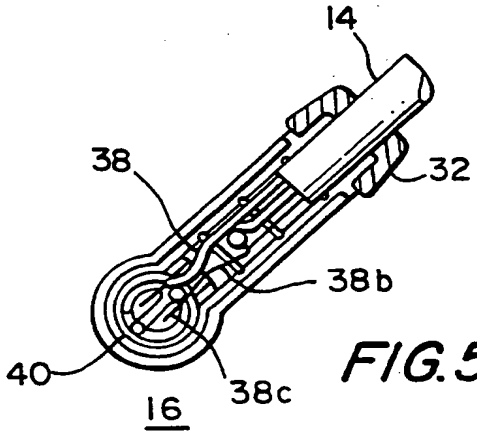


FIG.5

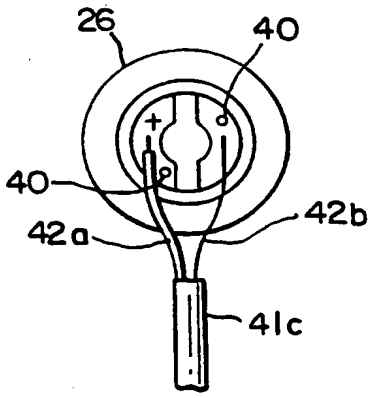


FIG.6

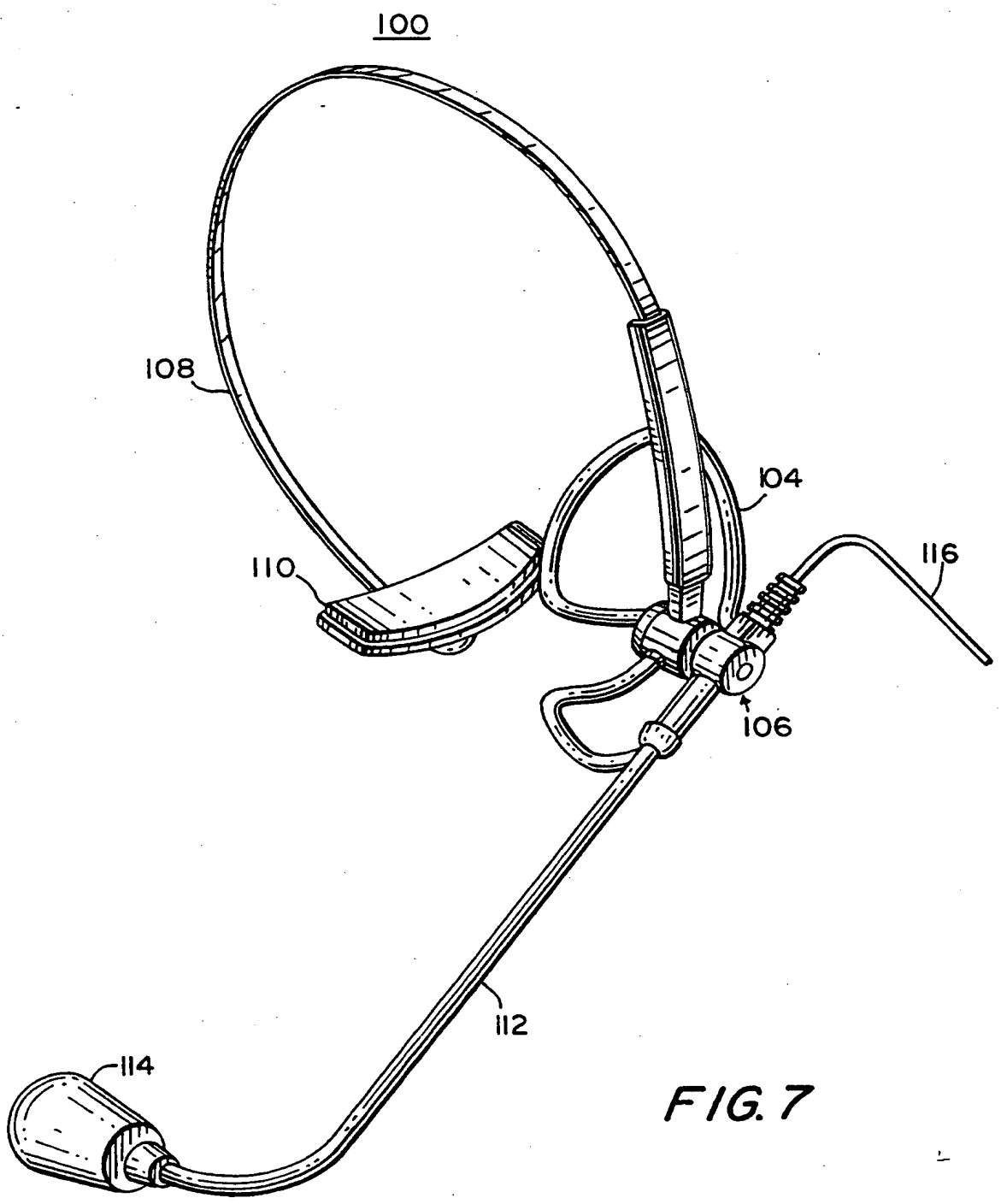


FIG. 7

FIG8

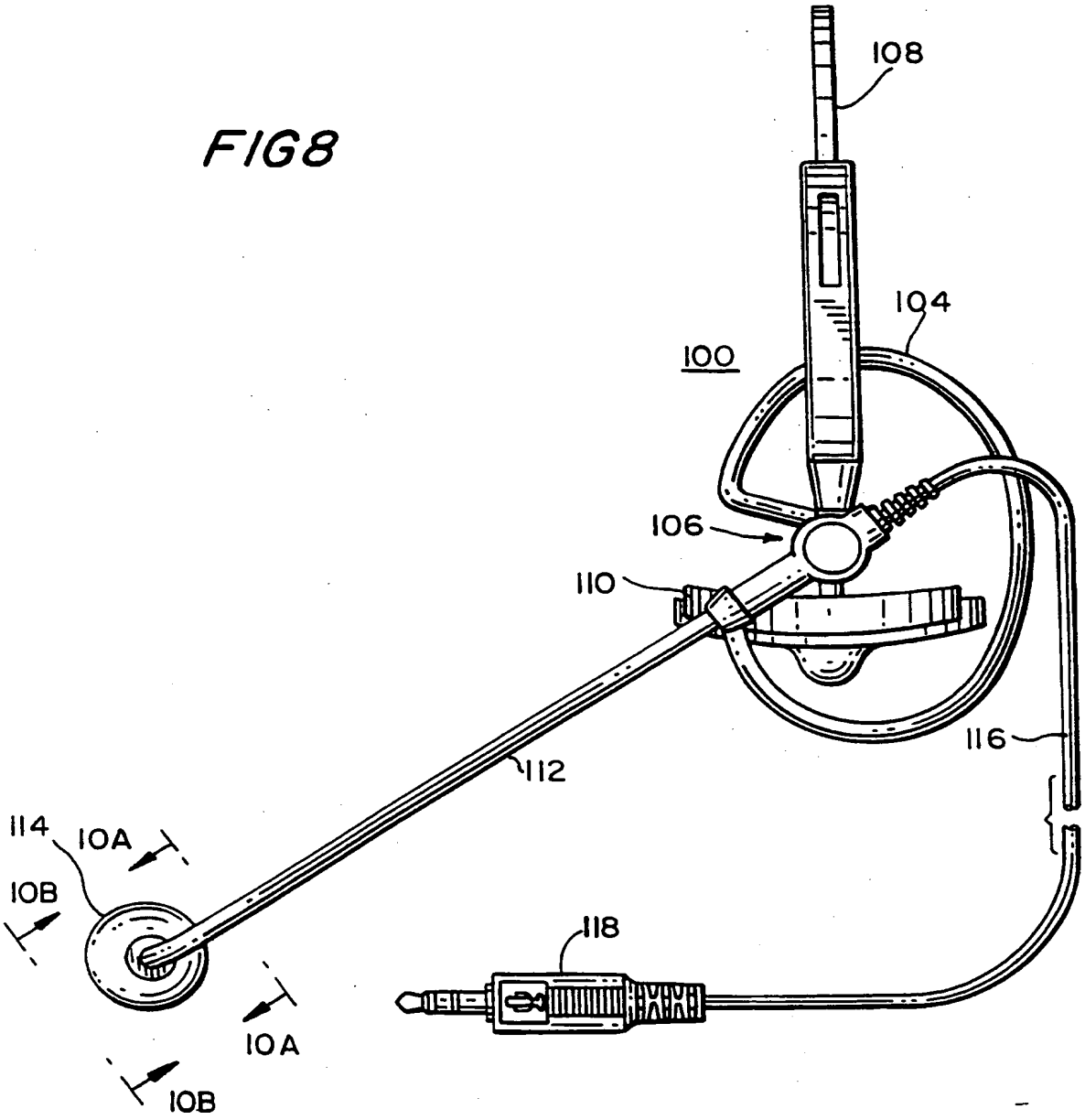
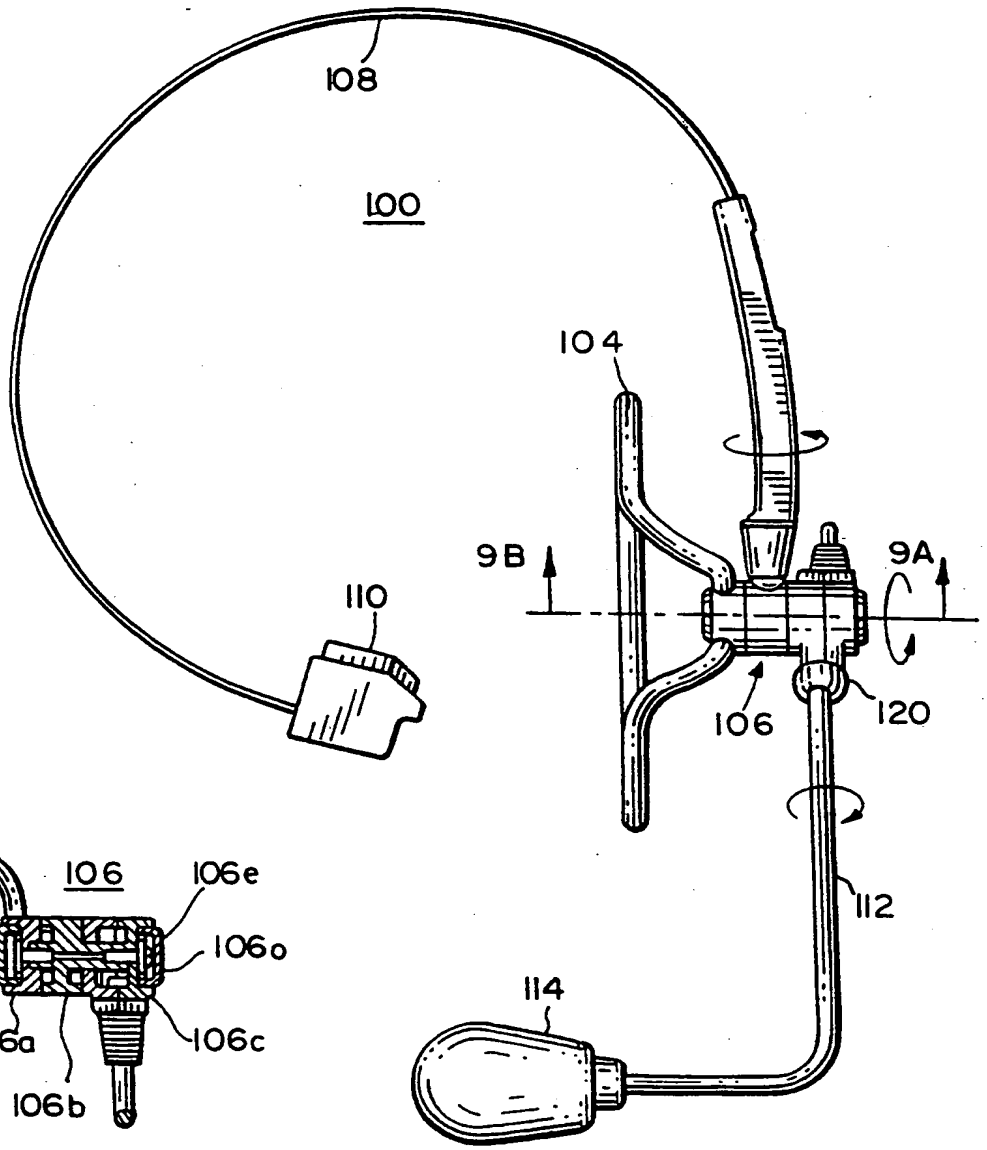


FIG.9A


108
100
104
9B
9A
110
106
120
112
114

106
106e
106e
106o
106d
106a
106c
106b

FIG.9B

FIG. 10A

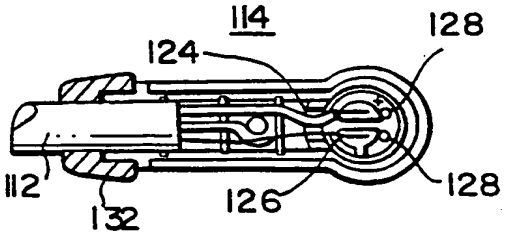


FIG. 10B

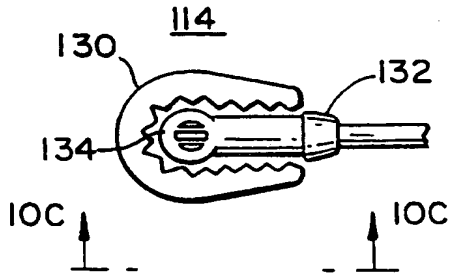


FIG. 10C

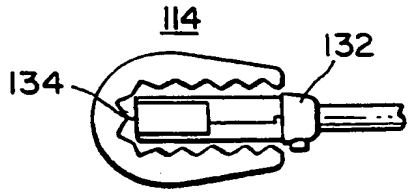


FIG. 11

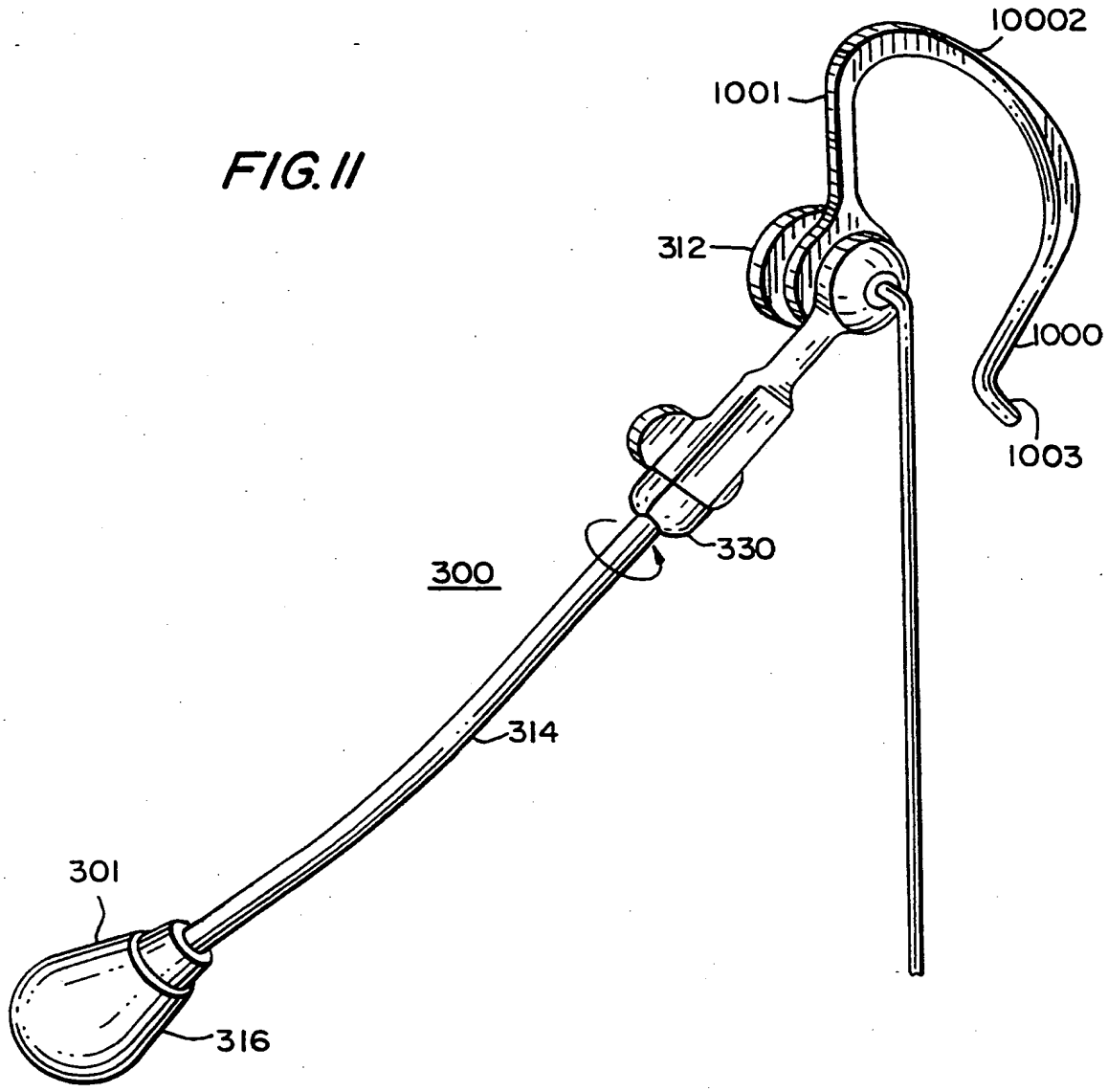


FIG.12

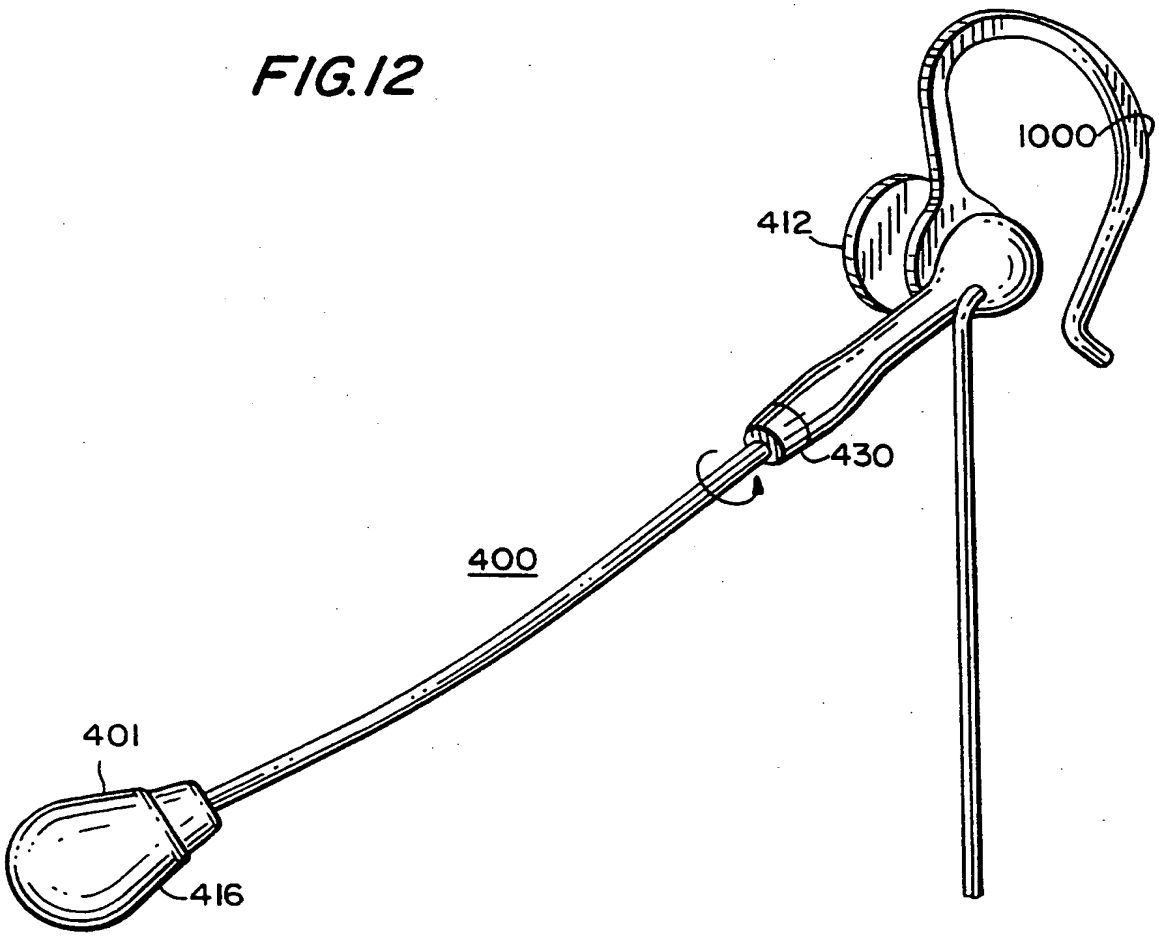
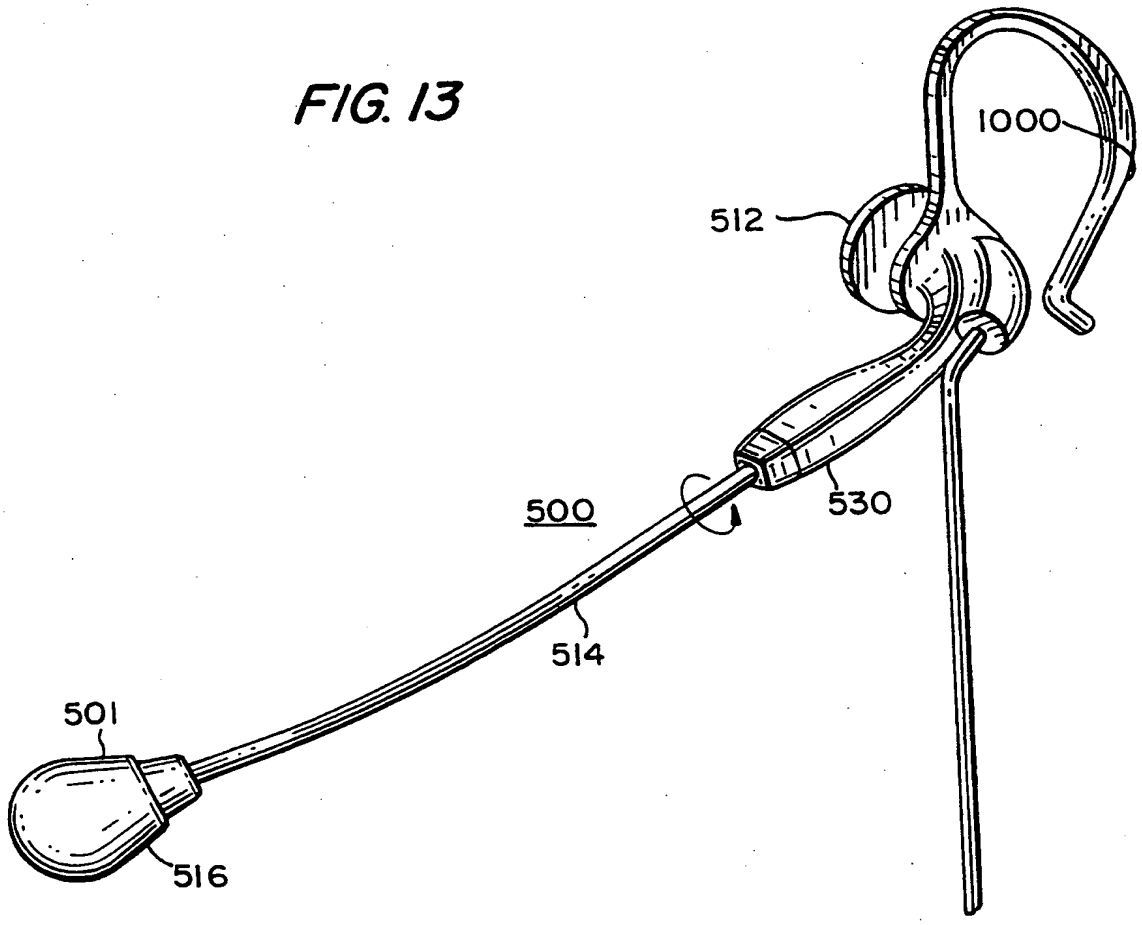


FIG. 13



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/20410

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04R 25/00
US CL :381/370, 374, 375, 381; 379/430.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 381/309, 370, 374, 375, 380, 381, FOR144, FOR149, FOR150; 379/430.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CA 2,070,956 A (AKERS et al.) 12 December 1992, figures 2-3, page 7, lines 19-20,	1, 3, and 6-8
X	DE 4,019,530 A1 (ANMELDER) 07 February 1991, figures 1 and 6	2 and 4
X	US 5,298,692 A (IKEDA et al.) 29 March 1994, see figures 9 and 12.	1 and 5

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

30 NOVEMBER 1998

Date of mailing of the international search report

15 JAN 1999

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer
HUYEN LE

Telephone No. (703) 305-4844

Form PCT/ISA/210 (second sheet)(July 1992)*